

PROCESS FOR TREATING BIOLOGICAL ORGANISMS

Field of the invention

A process for treating a biological organism with electromagnetic energy that is characterized by at least one major peak and one minor peak in its spectrum.

Background of the invention

The application of exterior photonic and other electromagnetic energy to a body for therapeutic purposes is well known. Thus, for example, United States patent 5,843,074 discloses "An improved non-coherent pulsed and colored light stimulation device used for therapeutic effects in living creatures." Similarly, United States patent 5,500,009 discloses "A method of treating herpes by illuminating a herpes affected dermal zone with continuous wave (CW) non-coherent radiation emitted by at least one light emitting diode (LED), the radiation having a narrow bandwidth centered at a wavelength suitable for herpes treatment, and maintaining the light radiation for a prescribed treatment duration." The entire disclosure of each of these United States patents is hereby incorporated by reference into this specification.

Chinese and other Eastern medical traditions have mapped out acupuncture points over the body. Other traditions have mapped out "meridian" and "chakra" points of the body. Devices have been developed to locate and measure (see United States patents 4,408,617 and 4,016,870) and stimulate (see United States patents 6,113,530 and 4,535,784) such "biologically active" points using light and/or other electromagnetic and/or vibrational and/or heat energies. The entire disclosure of each of these United States patents is hereby incorporated by reference into this specification.

It is known that the application of high frequency electromagnetic signals can have beneficial therapeutic effects on tissues. Thus, e.g., United States patent 6,246,912 discloses "A method and apparatus are provided for altering a function of tissue in a patient." The tissue affected can include that of the brain, as is disclosed in United States patent 5,983,141 ("Method and apparatus for altering neural tissue function"), which discloses "A method and apparatus for altering a function of neural tissue in a patient. An electromagnetic signal is applied to the neural tissue through an electrode." The entire disclosure of each of these United States patents is hereby incorporated by reference into this specification.

It is known that the application of extremely low frequency (less than 100 hertz) electromagnetic signals can have beneficial therapeutic effects. See, for example, the paper "Therapeutic aspects of electromagnetic fields for soft-tissue healing" by B. F. Siskin and J. Walker, 1995 published in Electromagnetic fields: biological interactions and mechanisms, M. Blank editor, Advances in Chemistry Series 250, American Chemical Society, Washington DC, pages 277-285.

Millimeter waves have wavelengths of from about 1 to about 10 millimeters, corresponding to frequencies of from about 300 to about 30 gigahertz. In recent years, a substantial amount of research has been conducted regarding the biological and medical effects of such millimeter waves. See, e.g., an article by A.G. Pakhomov et al. entitled "Current state and implications of research on biological effects of millimeter waves: A review of the literature," published in 1998 in *Bioelectromagnetics*, 19(7), at pages 393-413.

Today millimeter wave therapy, also known as "extremely high frequency therapy," has become an approved and accepted method of medical treatment in Russia and many former Soviet republics. More than 2,000 physicians from all over Russia have completed formal

education courses in Moscow on the medical uses of millimeter waves; the method is currently used in more than 1,500 hospitals and clinics in the Russian Federation; more than 1,000,000 patients have undergone this treatment; and more than 10,000 millimeter wave devices have been sold to research and clinical institutions. See, e.g., a paper by A.Yu. Lebedeva entitled “Millimeter waves in clinical practice in Russia: a Review” that was presented on October 31, 2000 in Zvenigorod, Russia at the 12th Russian Symposium on Millimeter Waves in Medicine and Biology.

It has been determined that low intensity millimeter waves (with power levels of less than about 11 milliwatts per square centimeter) have effects on cell growth and proliferation, activity of enzymes, the function of excitable membranes, peripheral receptors, and other biological systems. See, e.g., the aforementioned 1998 article by A.G. Pakhomov et al. It has also been determined that, in animals and humans, local millimeter wave exposure has stimulated tissue repair and regeneration, alleviated stress reactions, and facilitated recovery in a wide range of diseases. See, e.g., an 1999 article by N.N. Lebedeva and T.I. Kotorovskaya entitled “Experimental and clinical studies in the field of biological effects of millimeter waves” (review, part 1) published in Russian in *Millimetrovye Volny v. Biologii I Meditsine* (“Millimeter Waves in Medicine and Biology”), 3(15), pages 3-14.

Millimeter wave generators are well known to those skilled in the art and are commercially available. Thus, e.g., referring to United States patent 3,596,695, the entire disclosure of which is hereby incorporated by reference into this specification, it is disclosed that “Referring now to FIG. 1, there is illustrated in block form an apparatus embodying the present invention. The apparatus of FIG. 1 includes a variable microwave generator 10. The microwave generator 10 is continuously variable over a predetermined frequency range as indicated by the

arrow 11. Such microwave generators are readily obtainable in the trade. For example, Model No. 440XXH represents a series of microwave generators obtainable from Hughes Aircraft Company. By way of example, Model No. 44076H is a millimeter wave generator having a 3 milliwatt output over a 10 gigahertz bandwidth between 60 to 90 gigahertz and includes an isolator. Other models are available with other frequency ranges and with similar power outputs."

United States patent 6,101,015 discloses a microwave or millimeter wave generator. United States patent 5,777,572 discloses a gyrotron oscillator millimeter wave generator for producing high power millimeter wave beams for jamming and/or damaging electronic equipment; the generator of this patent produces 20 millisecond megawatt pulses at a frequency of from 100 to 140 gigahertz. United States patent 5,760,397 discloses a millimeter wave imaging system. United States patent 5,507,791 discloses a millimeter wave generator producing radiation with a frequency of from 40 to 70 gigahertz. United States patent 5,379,309 discloses a photonic down conversion system which employs a millimeter wave generator. In Figure 3 (element 15) of United States patent 5,344,099, a millimeter wave generator is shown. United States patent 5,227,800 discloses a millimeter wave generator used to illuminate objects in the field of view of a millimeter wave camera. A millimeter wave generator is mentioned in claim 16 of United States patent 5,223,352. United States patent 5,152,286 discloses a spark (noise) generator for producing extremely high frequency (EHF) electromagnetic radiation. United States patent 5,131,409 discloses a microwave resonance therapy generator. United States patent 4,306,174 discloses a radio wave generator for ultra-high frequencies. United States patent 4,286,230 discloses a near millimeter wave generator with a dielectric cavity. The

entire disclosure of each of these United States patents is hereby incorporated by reference into this specification.

Millimeter wave generators, devices incorporating them, and processing using them, are described in many different Russian patents. Reference may be had, e.g., to Russian patents 2122395 (method for treatment of auditory nerve neuritis), 2089166 (device for extremely high frequency therapy).

In a book entitled Light: Medicine of the Future, Bear and Company, Santa Fe, New Mexico, 1991, Jacob Liberman discussed the therapeutic effects of light for treating, e.g., cholesterol, cortisone, stress, cancer, venereal disease, viral infection, tuberculoses, etc. Reference also may be had, e.g., to United States patent 5,454,837.

The application of acoustic energy is also known to have therapeutic effects on the body and its tissues and organs. Thus, e.g., United States patent 5,687,729 discloses "A source of therapeutic acoustic waves for minimally invasive treatment of internal body regions with the therapeutic acoustic waves has a number of source parts which emit the acoustic waves." United States patent 5,458,130 discloses "Non-invasive therapeutic treatment and/or quantitative evaluation of musculoskeletal tissue are performed in vivo by subjecting musculoskeletal tissue to an ultrasonic acoustic signal pulse of finite duration, and involving a composite sine-wave signal consisting of plural discrete frequencies that are spaced in the ultrasonic region to approximately 2 megahertz the excitation signal is repeated substantially in the range 1 to 1000 Hz." United States patent 5,209,221 discloses "A device for generating sonic signal forms for limiting, preventing or regressing the growth of pathological tissue comprises an ultrasonic transmission system for transmitting sound waves, focused on the tissue to be treated, by way of

a coupling medium.” The entire disclosure of each of these United States patents is hereby incorporated by reference into this specification.

Bone material may also be treated using electromagnetic and/or vibrational energies. Thus, e.g., pulsing electromagnetic fields are widely used by orthopedic physicians to stimulate the healing of fracture non-unions. See, e.g., the 1995 article by CAL Bassett entitled “Bioelectromagnetics in the service of medicine” published in Electromagnet Fields: Biological Interactions and Mechanisms, M. Blank editor, Advances in Chemistry Series 250, American Chemical Society, Washington D.C., pp. 261-275. United States patent 5,309,898 discloses “Non-invasive therapeutic treatment and/or quantitative evaluation of bone tissue are performed in vivo, by subjecting bone to an ultrasonic acoustic signal pulse of finite duration, and involving a composite sine-wave signal consisting of plural discrete frequencies that are spaced in the ultrasonic region to approximately 2 MHz; the excitation signal is repeated substantially in the range 1 to 1000 Hz.” The entire disclosure of each of these United States patents is hereby incorporated by reference into this specification.

The application of acoustic energy to a biological system can produce an electromagnetic response. Applying both acoustic and electromagnetic energy at the same time has therapeutic effects on the body. International patent publication WO015097A2 discloses “The present invention makes use of resonant acoustic and/or acousto-EM energy applied to inorganic or biologic structures for the detection and/or identification, and for augmentation and/or disruption of function within the biologic structure.” The entire disclosure of this patent is hereby incorporated by reference into this specification.

Implantable medical devices are now commonplace. For example, United States patent 6,212,063 discloses "An implantable medical device such as a defibrillator is described." Another example is United States patent 6,143,035, which discloses "An implanted piezoelectric module generates charge which may be applied to tissue or used to power or recharge an implanted device such as a pump or pacemaker." The entire disclosure of each of these United States patents is hereby incorporated by reference into this specification.

It is known that the application of certain electromagnetic energies and signals can change the biological effectiveness of fluids including water. References to such effects include Dr. Alan Halls' book Water, Electricity and Health, Hawthorn Press, 1997 and references cited therein, as well as the papers "Digital Recording/Transmission of the Cholinergic Signal" by Dr. J. Benveniste, et. al. and references therein. Another reference is the 1987 article by R.V.S. Choy, J.A. Monro, and C.W. Smith, "Electrical sensitivities in allergy patients" published in *Clinical Ecology* IV(3):93-102, which states "A protocol for clinical testing has been devised based on the confrontation-neutralization technique for chemical allergens. Neutralizing frequencies can usually be found and magnetic fields at these frequencies can be used to "potentize" water for therapeutic purposes. In a given patient, the symptoms provoked electrically are similar to those provoked chemically and those provoked by the patient's environment. Electrical and chemical stimuli and neutralization appear to be interchangeable." Hence treatment of water and other bodily fluids could be included into existing internal or external devices which sample the bodily fluids. For example, insulin pumps, kidney machines, flow cytometers, and syringes.

Means are also available for sensing or predicting pathological disturbances or imbalances in physiological parameters. In some cases these sensors are useful in following changes in parameters during the course of treatments.

Transmural electrical potential differences have been suggested as an early marker for the detection of colon cancer. See the 1986 article by DA. Goller, W.F. Weidema, and R.J. Davies entitled "Transmural electrical potential difference as an early marker in colon cancer" published in Archives of Surgery 121:345-350. Surface electrical potentials have been tested in the diagnosis of breast lesions. See the 1994 article by B.A. Weiss, G.A.P. Ganepola, H.P. Freeman, Y-S Hsu, and M.L. Faupel entitled "Surface electrical potentials as a new modality in the diagnosis of breast lesions--A preliminary survey" published in Breast Diseases 7:91-98). Transcranial magnetic stimulation has been used to evaluate the probable outcome of patients post-stroke. See the 2000 article by U. Ziemann entitled "Transcranial magnetic stimulation: Its current role in the evaluation of patients post-stroke" published in Neurology Report 24(3):82-93.

The vulnerability of the heart to ventricular arrhythmias and sudden cardiac death has been correlated with certain patterns in the electrocardiogram known as T-wave alternans.

Noninvasive techniques are available that permit the accurate measurement in ambulatory patients. United States Patent, 5,560,368 discloses methodology for automated QT variability measurement to determine risk of malignant arrhythmias, that involves sensing fluctuations in voltage resulting from electrical activity of a heart and assessing changes in QT interval for each heartbeat using the entire T wave. United States Patent 5,555,888 discloses a method for automatic, adaptive assessment of myocardial electrical instability to assess the patient's

likelihood for myocardial electrical instability. The entire disclosure of each of these United States patents is hereby incorporated by reference into this specification.

Optical approaches to the non-invasive measurement of blood glucose are disclosed by R.W. Waynant and V.M. Chenault in an 1998 article entitled "Overview of non-invasive fluid glucose measurement using optical techniques to maintain glucose control in diabetes mellitus" published in IEEE Lasers and Electro-Optics Society Proceedings 12:2. Reference also may be had to a 1998 article by C. Marwick entitled "Development of noninvasive methods to monitor blood glucose levels in people with diabetes" published in the Journal of the American Medical Association 280(4):312-313. United States Patent 5,989,409 discloses a method for measuring the concentration of glucose diffused from a source to a working electrode which assembly includes a scavenging electrode. United States Patent 6,233,471 discloses a method for continually or continuously measuring the concentration of target chemical analytes present in a biological system, and processing analyte-specific signals to obtain a measurement value that is closely correlated with the concentration of the target chemical analyte in the biological system. One important application of the invention involves a method for signal processing in a system for monitoring blood glucose values. The entire disclosure of each of these United States patents is hereby incorporated by reference into this specification.

Electromagnetic probes can be used to monitor microvascular changes taking place in response to diabetes, as is disclosed by A.S. De Vriese, J. Van de Voorde, J.J. Blom, P.M. Vanhoutte, M. Verbeke, and N.H. Lameire in the 2000 article entitled "The impaired renal vasodilator response attributed to endothelium-derived hyperpolarizing factor in streptozotocin--induced diabetic rats is restored by 5-methyltetrahydrofolate" published in Diabetologia 43(9):1116-25. Sympathetic skin responses following both electrical nerve and magnetic brain

stimulations in insulin-dependent diabetic patients show an early yet detectable impairment of afferent pathways that takes place before the onset of peripheral neuropathy or dysautonomia, as is disclosed in a 1999 article by L. Saggiocco, F. Sartucci, O. Giampietro, and L. Murri entitled "Amplitude loss of electrically and magnetically evoked sympathetic skin responses in early stages of type 1 (insulin-dependent) diabetes mellitus without signs of dysautonomia" published in *Clinical Autonomic Research: Official Journal of the Clinical Autonomic Research Society* 9(1):5-10). The conduction of vibrations from tuning forks is being used to screen for sensation loss that can expose the diabetic patient to the risk of foot injury, as is disclosed in the 1990 article by P.H. Tchen, H.C. Chiu, and C.C. Fu entitled "Vibratory perception threshold in diabetic neuropathy" published in *Journal of the Formosan Medical Association* 89(1):23-9 and in the 1990 article by C. Liniger, A. Albeanu, D. Bloise, and J.P. Assal JP entitled "The tuning fork revisited" published in *Diabetic Medicine* 7(10):859-64. Functional changes in pulsatile arterial blood flow occur early in the time course of insulin-dependent diabetes and can be detected by measuring pulsatile waveforms noninvasively using an electromagnetic flowmeter, as is disclosed in a 1983 article by L.N. Cunningham, C. Labrie, J.S. Soeldner, and R.E. Gleason entitled "Resting and exercise hyperemic pulsatile arterial blood flow in insulin-dependent diabetic subjects" published in *Diabetes* 32(7):664-9. A non-invasive evaluation of lens fluorescence has been suggested as an early indicator of ocular complications associated with diabetes as is disclosed by M. Mota, A.M. Morgado, A. Matos, P. Pereira, and H. Burrows in 1999 in their article entitled "Evaluation of a non-invasive fluorescence technique as a marker for diabetic lenses in vivo" published in *Graefe's Archive for Clinical and Experimental Ophthalmology* 237(3):187-192.

The prior art devices and processes discussed above generally are not suitable for automatically detecting and treating a multitude of chronic disease states, are not readily adapted to treat small, localized internal regions of a living organism, and cannot readily and automatically modify the treatment regimen as the condition of the living organism changes.

Summary of the invention

In accordance with this invention, there is provided an implantable device comprised of means for emitting and delivering energy to specific sites within a body, a programmable controller for varying the type and/or amount of energy emitted, and means for sensing a condition of a biological organism. The energy emitted by the device comprises part or all of the spectra of a desired energy pattern, and it contains at least a major peak and a minor peak.

Brief description of the drawings

The invention will be described by reference to the following drawings, in which like numerals refer to like elements, and in which:

Figure 1 is a schematic of one preferred implantable device of this invention disposed within a patient;

Figure 2 is a block diagram of one possible process for determining and subsequently utilization of an energy pattern;

Figures 3 through 8 are schematic diagrams of various arrangements of one or more implantable devices disposed within a patient;

Figure 9 is a flow diagram of the operation of the device of Figure 4; and

Figures 10, 11, and 12 are graphs of some of the energy patterns delivered to a patient in one of the preferred processes of this invention.

Figure 13 shows a shunt configuration.

Figure 14 is a schematic showing utilization of the invention in a tube or pipe.

Figure 15 is a schematic showing utilization of the invention in a fluid holding vessel.

Description of the preferred embodiments

In one embodiment of this invention, spectral analyses is used to describe some of the properties of a specified electromagnetic energy pattern. The term spectral analysis, as used in this specification, refers to the determination of the distribution of frequencies or wavelengths of transmission or absorption, or both, within the energy spectrum; it is an analytical technique for identification of materials, or of electromagnetic, vibrational, rotational frequencies. See, e.g., United States patents 6,191,417 (mass spectrometer), 6,191,271, 6,043,276, 5,902, 772, 5,814,314, 5,565,037, 5,462,751, 5,334,394, 4,997,842, and the like. The entire disclosure of each of these United States patents is hereby incorporated by reference into this specification.

Similarly, the terms energy spectrum or spectrum or spectra or energy pattern, are used in this specification. These terms refer to the set of electromagnetic, vibrational, rotational, or other energy type, pattern of frequencies. Frequencies and waveforms can be combined in different ways including, but limited to, amplitude modulation, frequency modulation, pulsating direct current, square wave, sawtooth waves, ramping, etc.) These patterns may be determined or composed by means illustrated in Figure 2.

One embodiment of this invention involves the application of an electromagnetic energy to an organism. The organism used in the process of this invention may be, but need not be, a living biological organism. Thus, by way of illustration and not limitation, the processes of this invention may be used with organs harvested from people who recently have died and wish to donate such organs.

The organism may be an animal organism, such as, e.g., a human being, a mammal, a reptile, and the like. Alternatively, or additionally, the organism may be a vegetable organism, such as a food crop. Alternatively, or additionally, the organism may be a virus, a bacteria, a mold, a yeast, a protozoa, and/or one or more other life forms.

By way of further illustration, one may treat via the process of this invention genetically modified bacteria used in cell cultures. In one aspect of this embodiment, the organisms used in fermentation processes (such as, e.g., making bread, brewing alcohol) may be treated with one or more forms of energy to insure their viability and/or optimal performance.

By way of further illustration, one may use one or more radiations in hydroponic farming to increase the yields of certain crops.

By way of further illustration, one may implant an energy emitting device into a tree and/or other plant to increase its growth and/or production and/or disease resistance.

It is known that very minute alterations to molecules and fluids, such as blood or water, can have dramatic therapeutic effects, and that it is possible to digitize the method for effecting the alterations of these treatments and transmit them electronically so that they can be repeated with high precision at a later time and if necessary in a different place. As a result, complex diagnostics, including imaging and chemical analyses, can be conducted of tissue or fluid samples at a remote site, and a patient prescription provided for treating the situation that can be transmitted to the patient location and administered locally.

Figure 1 is a schematic of one implantable device of this invention. Referring to Figure 1, and in the preferred embodiment depicted therein, it will be seen that an energy emitter 16 is implanted into a biological organism 10, preferably in the proximity of an organ 12. In the embodiment depicted, the emitter 16 emits photonic or other electromagnetic energy 14 onto

organ 12. The energy 14 may, e.g., be electrostatic, magnetostatic, acoustic, or very low frequency (VLF) through ultraviolet electromagnetic signals.

In one embodiment, the emitter 16 is utilized to effect a process for treating the body 10. In this process, one first determines the electromagnetic pattern of a biological process within body 10. This energy pattern determination may be made, e.g., by the process depicted in Figure 2. Once the electromagnetic or other energy pattern has been determined, a portion of said energy pattern may be directly applied within the body 10. The energy pattern preferably is characterized by at least one major peak and one minor peak in its spectrum.

In one preferred embodiment, the energy emitted by emitter 16 varies with time in either its frequencies and/or amplitudes and/or phases. In another preferred embodiment, the energy spectrum emitted by emitter 16 varies with time. Thus, by way of illustration, one may transmit the spectra of a drug as it dissolves in the organism and interacts with the organism over time.

In another embodiment, the energy emitted by emitter 16 has a spectrum with at least one major peak and one minor peak. In another embodiment, the energy emitted by emitter 16 contains at least 5 major peaks and minor peaks.

In one embodiment, the energy emitted by emitter 16 has at least 10 major and/or minor peaks.

In one embodiment, the energy emitted by emitter 16 is a combination of energies selected from the group consisting of photonic energy, vibratory energy, electrical energy, and mixtures thereof, provided that, in this embodiment, at least two of such energies are emitted.

In one aspect of this embodiment, millimeter and/or centimeter wavelength energy is used. In general, this energy has a frequency of from about 30 to about 300 gigahertz. In some papers, reference to "millimeter waves" refers to frequencies around 60 gigahertz.

By way of further illustration, one may use energy of from about 1 to about 3 hertz to regenerate nerves. One may use an energy of from about 5 to about 9 hertz to promote bone growth. One may use an energy of about 10 hertz to heal ligaments. Energies of 15, 20, and 72 hertz decrease skin necrosis, stimulate capillary formation, and cause the proliferation of fibroblasts. Energies of 25 and 50 hertz promote synergistic effects with nerve growth factor. In general, the use of energies from about 1 to about 100 hertz promotes healing of many bodily parts.

Resistant myofascial pain can be treated with microcurrent of specific frequencies, as is disclosed in a 1998 article by C. McMakin entitled "Microcurrent treatment of myofascial pain in the head, neck, and face" published in Topics in Clinical Chiropractic 5(1):29-35. Chronic wounds can be treated by electric and electromagnetic fields, as is disclosed in a 1992 article by L. Vodovink and R. Karba entitled "Treatment of chronic wounds by means of electric and electromagnetic fields. Part 1. Literature review" published in Medical and Biological Engineering & Computing 30:257-266. A variety of soft tissues have been treated with pulsing electromagnetic fields and 27 megahertz electromagnetic frequencies, as is disclosed by B.F. Sisken and J. Walker in an article published in 1995 with the title "Therapeutic aspects of electromagnetic fields for soft-tissue healing" in Advances in Chemistry Series 250, American Chemical Society, Washington DC, pp. 277-285. Photoradiation therapy has been used for the treatment of malignant tumors, as was disclosed in 1978 by T.J. Dougherty, J.E. Kaufman, A. Goldfarb, K.R. Weishaupt, D. Boyd, and A. Mittleman in an article entitled "Photoradiation therapy for the treatment of malignant tumors" published in Cancer Research 38:2628-2635). Weak direct current fields or stronger alternating current fields enhance the sprouting of intact saphenous nerves in rats, as is disclosed in an article by B. Pomeranz, M. Mullen, and H.

Markus in 1984 with the title "Effect of applied electrical fields on sprouting of intact saphenous nerve in adult rat" published in Brain Research 303:331-336; and electrical fields enhance the regeneration of spinal cord in the lamprey, as is disclosed by R.B. Borgens, E. Roederer and M.J. Cohen in a 1981 article entitled "Enhanced spinal cord regeneration in lamprey by applied electric fields" published in Science 213:611-617. Scalar waves have been used to stimulate the immune system, as is disclosed by G. Rein in a 1989 article entitled "Effect of non-hertzian scalar waves on the immune system" published in the US Psychotronic Association Journal 1:15, and in another article by G. Rein published in 1998 entitled "Biological Effects of Quantum Fields and their Role in the Natural Healing Process" published in Frontier Perspectives 7(1):16-23. Skin wounds and intractable ulcers have been stimulated to heal faster with application of electrical fields, as is disclosed by D.S. Weiss, R. Kirsner, and W.H. Eaglstein in 1990 in an article entitled "Electrical stimulation and wound healing" published in Archives of Dermatology 126:222-225. Infrasound has been used in a wide variety of clinical situations, as is disclosed by R.R. Sunderlage in 1996 in a paper entitled "Clinical applications of infrasound therapy and clinical case studies" published as a research paper submitted to the Midwest Center for the Study of Oriental Medicine, course #A572, December 21, 1996. Low frequency current pulses have been used over many years in electroacupuncture, as is disclosed by R. Voll, et. al. and summarized in the 1999 book Virtual Medicine by K Scott-Mumby and published by Harper Collins, London. Externally applied picotesla magnetic fields have been used to treat neurologic disorders as disclosed by J.I. Jacobson and W.S. Yamanashi in 1994 in an article entitled "A possible physical mechanism in the treatment of neurologic disorders with externally applied picotesla magnetic fields" published in Subtle Energies 5(3):239-252.

Laser acupuncture has been used to treat paralysis in stroke patients, as is disclosed by M.A. Naeser, M.P. Alexander, D. Stiassny-Eder, V. Galler, J. Hobbs, D. Bachman, and L.N. Lannin in 1995 in an article entitled "Laser Acupuncture in the Treatment of Paralysis in Stroke Patients: A CT Scan Lesion Site Study" published in the American Journal of Acupuncture 23(1):13-28. In general, the use of energies from about 1 to about 100 hertz promotes healing of many bodily parts, with some studies showing effects at much higher frequencies into the terahertz range. Millimeter waves are being utilized for the treatment of pain as disclosed by A.A. Radzievsky, M.A. Rojavin, A. Cowan, S.I. Alekseev, A.A. Radzievsky Jr, and M.C. Ziskin in a 2001 article entitle "Peripheral neural system involvement in hypoalgesic effect of electromagnetic millimeter waves" published in Life Science 68(10):1143-51.

United States Patent 4,528,256 discloses that cells can be modified "by subjecting them to the influence of ions from a metal electrode, for example of silver, which is placed in contact with them and which is made electrically positive, causing low intensity direct current to flow through them. The cells, which are relatively specialized, such as normal mammalian fibroblasts, assume a simpler, relatively unspecialized form and come to resemble hematopoietic or marrow-like cells." The process leads to improved therapeutic effects, "such as enhanced cell or biochemical production, enhanced lesion healing, enhanced normal tissue growth or regeneration, cell dedifferentiation, changing cancer cell form, and stopping multiplication of cancer cells." The entire disclosure of this patent is hereby incorporated by reference into this specification.

A light source called the MFbio-spectrum lamp treatment has been successful in treatment of diabetes, as is disclosed by G. Wu in 2000 in an article published on the web at <http://www.findhealr.com/mall/telstar/clinic/diabetes.php3>). Pulsed electromagnetic fields are

being used to stimulate cutaneous wound healing in diabetic rats, as is disclosed by O. Patino, D. Grana, A. Bolgiani, G. Prezzavento, J. Mino, A. Merlo, and F. Benaim in a 1996 article entitled "Pulsed electromagnetic fields in experimental cutaneous wound healing in rats" published in the Journal of Burn Care Rehabilitation 17(6 Pt 1):528-31. Magnetotherapy is being applied to the comprehensive treatment of vascular complications of diabetes mellitus, as is disclosed by I.B. Kirillov, Z.V. Suchkova, A.V. Lastushkin, A.A. Sigaev, and T.I. Nekhaeva in a 1996 article entitled "Magnetotherapy in the comprehensive treatment of vascular complications of diabetes mellitus" published in Klinicheskaya Meditsina (Moskva) 74(5):39-41). Pulsating high-frequency electromagnetic fields are being used to treat patients with diabetic neuropathies and angiopathies, as is disclosed by V. Vesovic-Potic and S. Conic in a 1993 article entitled "Use of pulsating high-frequency electromagnetic fields in patients with diabetic neuropathies and angiopathies" published in Srpski Arhiv Za Celokupno Lekarstvo (Beograd) 121(8-12):124-6. Suppurative wounds in patients with diabetes mellitus are being treated by magnetic field and laser irradiation, as is disclosed by R.A. Kuliev, R.F. Babaev, L.M. Akhmedova, and A.I. Ragimova in a 1992 article entitled "Treatment of suppurative wounds in patients with diabetes mellitus by magnetic field and laser irradiation" published in Khirurgiya (Moskva) (7-8):30-3). Electromagnetic stimulation of the rat pancreas lowers serum glucose levels in rats, as is disclosed by P.O. Milch, J.B. Ott, R.J. Kurtz, and E. Findl in a 1981 article entitled "Electromagnetic stimulation of the rat pancreas and the lowering of serum glucose levels" published in Transactions - American Society for Artificial Internal Organs 27:246-9). Non-invasive electromagnetic flowmetry (NMF) using external magnets and flowmetry by NMR are being used for screening for arterial diseases, monitoring of the treatment, and study of hardened arteries in diabetes, as is disclosed by H. Boccalon in 1989 in

an article entitled "The necessary advantage of measuring the pulsatile arterial flow of the limbs in patients with arterial disease" published in *Annales de Cardiologie et d'Angéiologie* (Paris) 38(8):461-4).

Referring again to the Figures, and in one embodiment, the energy utilized in the process of this invention has a frequency of at least 1,000 gigahertz (one terahertz) and is believed to cause deoxyribonucleic acid to resonate. In this embodiment, a multiplicity of different frequencies, each of which has a frequency of at least one terahertz, are used.

Figure 2 is a flow diagram which illustrates one preferred embodiment of the energy pattern determination process of this invention. In step 11 of the process, the spectrum of a therapeutic agent is determined by spectral analysis, or by reference to standard tables of the spectrum of the agent.

In one embodiment, one may determine the vibrational spectrum of the agent by conventional means. Thus, e.g., one may determine the vibrational spectrum of a drug by the means disclosed in one or more of United States patents 6,232,499, 6,040,191, 5,912,179, 5,866,430, 5,848,977, 5,733,739, 5,733,507, 5,712,165, 5,555,366, 5,386,507, and the like. The entire disclosure of each of these United States patents is hereby incorporated by reference into this specification. Reference also may be had, e.g., to John A. Dean's "Analytical Chemistry Handbook" (McGraw-Hill, Inc., New York, 1995).

In another embodiment, one may determine the electromagnetic spectrum of the therapeutic agent; see, e.g., United States patents 6,178,346 and 5,210,590 (rapid scanning spectrographic analyzer), and the like, the entire disclosure of each of which is hereby incorporated by reference into this specification. Thus, e.g., one may determine the optical spectrum of the therapeutic agent by the means disclosed in United States patents, 6,251,280, 6,246,901,

6,167,297, 5,977,162, 5,853,370, 5,833,603, 5,622,945, 5,410,045, 5,330,741, 5,135,717, 4,980,566, 4,711,245, 4,250,394, and the like, the entire disclosure of each of which is hereby incorporated by reference into this specification.

Referring again to Figure 2, and in the preferred embodiment depicted therein, in step 11 the spectrum of a chemical agent is determined ex vivo, outside of a biological organism. Alternatively, or additionally, one may determine the spectrum of a chemical agent in vivo in step 13 by conventional means. In both step 11 and 13, one may determine the spectrum of only one agent, or of two or more agents, in various combinations and at various concentrations. Alternatively, or additionally, one may determine the spectrum of one or more agents over a period of time. As is known to those skilled in the art, a drug within a biological organism will change its physical and/or chemical identity, due to dissolution in one or more solvents and/or reaction with one or more agents within the body. As the physical and chemical properties of the drug change, so does its spectrum.

It is known that signal molecules can activate their corresponding receptor sites without physical contact. See, e.g., an article by C.W. Smith, "Electromagnetic effects in humans," in *Biological Coherence and Response to External Stimuli*, Frohlich H (editor), Springer-Verlag, Berlin, pages 205-232. Reference also may be had to James L. Oschman's book Energy Medicine: The Scientific Basis (Churchill Livingston, New York, New York, 2000) and a book published in 1957 by A. Szent-Gyorgyi entitled Bioenergetics, published by Academic Press, New York. In one preferred process of this invention, the energy patterns from signal molecules are used without their corresponding drugs to treat the receptor sites. Once one has determined a desired receptor response produced by a specified drug or combination of drugs, one may then evaluate which combination of energy pattern stimuli will produce the same response in step 19

of the process. Reference may be had to United States patent 6,242,209. The entire disclosure of this United States patent is hereby incorporated by reference into this specification.

Alternatively, and as is illustrated in step 15, one may determine the spectrum response of a receptor site to various stimuli, including stimulation by drugs as well as stimulation by application of various energy patterns or by combinations. Alternatively, one may determine the spectrum of the receptor site, over time, as it is exposed to a drug. By trial and error, one may determine what combination of stimuli produce the desired receptor response.

The set of drug compounds available to the medical community is limited by available chemical synthesis technology, and by precursor chemical structures available from organic, inorganic, botanical, or animal sources. Thus there is a practical limit to the array of signal molecules that can be used to elicit a cellular response. The cells themselves, and the receptor sites in particular, are under no such restriction. Thus there are a wide variety of electromagnetic spectra that have no corresponding available synthesized chemical structure, but which spectra may have effective, and even superior, therapeutic affect at the desired receptor site when used in the manner described in this invention. One approach to determine the specific receptor spectrum is to excite the receptor with an ultra short energy pulse, measure the resulting spectrum, and perform a mathematical transform on the resulting spectrum to determine the ideal-fit complementary spectrum that would be associated with the ideal-fit chemical compound. This approach shall be referred to as 'receptor response spectrum development' for descriptive purposes and is included in Figure 2, step 15.

Alternatively, electromagnetic signals can be designed on the basis of highly specific information on the structure and operation of receptor sites on and within cells. The growing information on the molecular configurations of receptors and on the mechanisms taking place

when ligands interact with receptors provides a wealth of opportunities for the design of highly specific electromagnetic therapies. We now know that what has been referred to in the past as "a receptor" can actually have several functional domains. There is a ligand-binding domain and an effector domain. The ligand-binding domain is the specific site, often on the cell surface, where a regulator ligand (such as a hormone, growth factor, or neurotransmitter) has its primary action. The effector domain consists of a series of intermediary cellular molecules in the signal transduction pathway. Drugs and electromagnetic fields can interact with both of these domains, including the domains of the second messenger molecules that convey messages within cells. Recent advances in computational chemistry, structural analysis of organic compounds, and biochemical measurement of the primary actions of drugs at their receptors have permitted the design of new and more specific drugs. The same information can be used in the de novo design of highly specific electromagnetic interventions. Moreover, recent advances in determining the structures of drug-receptor complexes, at atomic resolution by X-ray crystallography or nuclear magnetic resonance spectroscopy, are even more helpful, and offer great promise for the design of electromagnetic signals of extreme potency and specificity.

Alternatively, as is illustrated in Figure 2, step 17, one may determine a therapeutic energy pattern by subjecting the body and/or individual organs, tissues, bodily fluids, cells, cells in culture to various energy patterns and recording the response.

Alternatively, as illustrated in Figure 2, step 17B, one may determine a therapeutic energy pattern by measuring the energy patterns of a healthy body, and/or individual organs, tissues, bodily fluids, cells. Additionally, the energy patterns emitted by the body as one is placed into various meditative states may be recorded. Thus, e.g., the hands, e.g., can emit a range of electromagnetic frequencies from about 0.3 hertz to 30 hertz (see, e.g., an article by J.

Zimmerman, 1985 "New technologies detect effects of healing hands" published in Brain Mind Bulletin 10 (September 30 issue, p. 3)). As disclosed by Zimmerman, the emitted electromagnetic energy may sweep through this frequency range rather than being a fixed frequency.

Referring again to Figure 2, once a desired energy spectrum, or portion thereof, or combination of one or more such spectra, is identified, it may be evaluated in step 19 against other candidate spectra. The response of a biological body, or a portion thereof, can be determined, and a correlation can be made between the use of a specified spectrum and/or spectra and the response of the organism. Thereafter, in step 21 of the process, a spectrum and/or spectra may be selected for any particular condition to be treated in the biological organism; and information about this selected spectrum/spectra may be incorporated into a program in step 23. In step 25, the program may be incorporated into a device which is capable of sensing the condition within the biological organism, selecting the appropriate spectrum/spectra from its database, emitting such energy pattern and directing it to the appropriate site within the organism, sensing the response of the living organism to such emission, modifying such emission as appropriate, and/or ceasing such emission as appropriate.

In portion 27 of the process, which is comprised of steps 11 through 25, the steps necessary to identify the appropriate energy pattern are described. In portion 29 of the process, comprising steps 31 through 37, the steps necessary to apply the selected energy pattern to the living organism are described.

In step 31 of the process, which is optional, one may utilize an external monitor/reprogrammer for bi-directional communication between the implanted device and the

outside world. With such a monitor/reprogrammer, one can visually observe indicia of the state of biological organism and, as appropriate, change the program of the implanted device.

The external monitor/reprogrammer is operatively connected to the implanted energy device of step 33 which, in response to external stimuli and/or in vivo stimuli provided by the biological organism, provides energy to biological organism of step 35. In one embodiment, depicted in step 37, a sensor which can monitor the response of the living organism to the applied energy and, with use of a programmable computer (not shown), continually modifies the energy delivered to the organism. The connection between the external monitor/reprogrammer 31 and the energy device may be direct, or it may be indirect. In one embodiment, the connection is indirect and is made, e.g., by means of transceivers.

In another embodiment of this invention, illustrated in Figure 3, an emitter 26 is attached to the end of a catheter 24 and is controlled by a controller 28. In the embodiment depicted in this Figure 3, the catheter is inserted into body 10 through an incision 22. The organ 20 is then irradiated with the electromagnetic energy 30. An operator, not shown, may control the electromagnetic energy by adjusting parameters of the controller 28.

In another embodiment of this invention, illustrated in Figure 4, an emitter 16 is an augmentation module connected to an implanted heart pacemaker 40; in the embodiment, the pacemaker 40 is connected via lead 42 to the heart 12. This augmentation module may be attached to the pacemaker 40 at any future date after the pacemaker 40 has been implanted without removal or otherwise replacement of the original pacemaker 40. Alternatively, the augmentation module may be implanted at the same time as the pacemaker 40. In either situation, the augmentation unit may be detached from the pacemaker 40 and removed from the body 10 at any time without significant disruption of the pacemaker 40. A controller with a

programmable logic unit 44 is connected to the emitter 16 and the pacemaker 40. The controller 44 also has communication means 48 to implanted sensors 46. The emitter 16 may be activated by the analyses of the sensors' input and comparison to threshold conditions or comparison to a programmable database of deleterious conditions. The emitted energy 14 may be adjusted from very low frequency to ultraviolet or terahertz range frequency programmatically through the controller's programmable logic unit 44. The emitted electromagnetic or vibrational energy signals produced by the augmentation modules may be a reproduction of the natural energy signals emitted from a healthy organ. In this way, a healthy signal may reinforce a non-healthy organ as well as to propagate a healthy signal to other organs.

Referring to Figure 4, the sensors 46 are capable of determining the electromagnetic pattern and/or other physiological and/or biochemical and/or biophysical parameter of any portion of the body 10 while such body is functioning. One may determine the electromagnetic pattern of such body when, e.g., the liver is functioning properly. One may determine the electromagnetic pattern of such body when, e.g., the liver is not functioning properly. One may, e.g., determine the electromagnetic pattern of the heart in relation to diagnostic indicators of susceptibility to arrhythmias of various kinds. One may, e.g., determine the electromagnetic pattern of such body when the liver is exposed to one or more drugs, or to heat, or to any treatment. By making these measurements, one can correlate the optimum performance of, e.g., the liver with optimum electromagnetic patterns. Similar correlations can be made with other organs and/or bodily processes.

Once such correlations have been made, using the methods disclosed herein or by reference to research studies conducted by others, one can deliver to the patient, via emitter 16, that portion of the spectral pattern which is advantageous to the patient at times when it is

advantageous to the patient. Thus, e.g., the sensors 46 can determine when, e.g., the liver is malfunctioning and deliver the required electromagnetic radiation to the patient, either alone and/or in combination with one or more drugs, until the liver is functioning properly.

In the preferred embodiment depicted in Figure 4, an implantable drug dispenser 240 is operatively connected to the controller 44 and, as required, delivers one or more drugs in response to the commands of such controller 44. As will be apparent to those skilled in the art, the process depicted in Figure 9 may be effected by the device depicted in Figure 4.

In one embodiment, as depicted in Figure 4, the sensors 46 are so constructed and situated as to detect energy patterns in the environment, external to the body 10. Controller 44 can analyze such patterns and can determine if such external energy patterns are disruptive to the body 10 or to the treatment currently administered. If such a disruptive external energy pattern is detected, the controller 44 may change the energy pattern emitted from emitter 16 or halt the administration of treatment until the disruptive external energy patterns are no longer detected and/or notify the patient through communications device 41 using communication channel 43. Communications channel 43 may be, e.g. by radio frequency means.

In another embodiment of this invention, also depicted in Figure 4, the sensors 46 are so constructed and situated as to detect disturbances in the interplanetary and/or geomagnetic fields that have been correlated with vulnerability to myocardial infarction, cardiac arrhythmias, stroke, seizures, depression, and mortality in general, as is disclosed by Y.I. Gurfinkel, V.V. Lyubimov, V.N. Orayevskii, L.M. Parfenova and A.S. Yur'ef in a 1995 article entitled "Effect of Geomagnetic disturbances on Capillary Blood Flow in Patients Suffering from Ischaemic Disease of the Heart" published in Biophysics 40(4):777-783' in a 2001 article by Y.I. Gurfinkel, V.L. Voeikof, E.V. Buravlyova and S.E. Kondakov entitled "Effect of Geomagnetic Storms on

the Erythrocyte Sedimentation Rate in Ischaemic Patients” in Critical Reviews in Biomedical Engineering published by Begell House, Inc; in a 1995 article by G. Villoresi, T.K. Breus, L.I. Dorman, N. Iucci and S.I. Rapoport entitle “Effect of Interplanetary and Geomagnetic Disturbances on the Rise in the Number of Clinically Severe Medical Pathologies (Myocardial Infarction and Stroke)” published in Biophysics 40(5):983-993; in a 1995 article by F.J. Lucatelli and E.J. Pane entitled “Correlation Between Cosmophysical Factors and the Onset of Manic-Depressive Psychosis” published in Biophysics 40(5):1023-1027; in a 1998 article by T.L. Gulyaeva entitled “Mortality Correlates of Cosmic and Meteorological Factors” published in Biophysics 43(5):789-795; in a 1976 article by K. Venkataraman with the title “Epilepsy and Solar Activity--An Hypothesis” published in Neurology India 24:148-152; and in a 1981 article by M. Rajaram and S. Mitra entitled “Correlation Between Convulsive Seizure and Geomagnetic Activity” published in Neurosciences Letters 24:187-191. Other disorders have been correlated with very low frequency atmospherics or VLF-sferics caused by atmospheric discharges (lightening), as is disclosed by A. Schienle, R. Stark, and D. Vaitl in a 1998 article with the title “Biological Effects of Very Low Frequency (VLF) Atmospherics in Humans: A Review” published in the Journal of Scientific Exploration 12(3):455-469. Controller 44 can analyze such environmental patterns and can determine if such patterns are disruptive to the body 10 or to the treatment currently administered. If such a disruptive external energy pattern is detected, the controller 44 may change the energy pattern emitted from emitter 16, halt the administration of treatment until the disruptive external energy patterns are no longer detected, introduce a protective energy pattern such as an enhanced pacemaker signal, and/or notify the patient through communications device 41 using communication channel 43.

In another embodiment of this invention, illustrated in Figure 5, an emitter 16 implanted in body 10 emits electromagnetic energy 14 onto or within an organ 12. Additionally, a probe 62 with an emitter 64 at the insertion tip of a catheter is inserted into the body 10 through incision 68. The inserted probe emitter 64 emits electromagnetic energy 66 onto the organ 12 from a different orientation than that of emitter 16. The electromagnetic energy 66 which is emitted from the probe emitter is controlled via controller 60 and need not have the same characteristics as the electromagnetic energy emitted from emitter 16.

Figure 6 illustrates an embodiment in which an emitter 16 implanted in body 10 emits electromagnetic energy 14 onto an organ 12, and an external device 80 delivers vibratory energy 82 to the organ 12. In one aspect of this embodiment, emitter 16 continually emits energy, whereas external device 80 intermittently emits energy. Other external devices 81 and 83 may also deliver various energy patterns to the body 10.

In one embodiment, illustrated in Figure 6, electromagnetic energy may be delivered through a device located outside of the patient's body, such as a watch 81 and/or external appliances 80 and/or 83 and/or in glasses frames (not shown) ankle bracelets (not shown), etc.

In another embodiment of this invention, illustrated in Figure 7, an electromagnetic emitter 16 implanted in body 10 emits electromagnetic energy 14 onto an organ 12. Additionally, a vibrational energy emitter 90 is also implanted into body 10 and delivers vibrational energy 94 to organ 92. The emitter 90 also consists of a sensor element. Additionally, other sensor devices 96 are implanted into body 10. All of such implanted devices are in communication through communication channels 98 to form a network. The communication means may be through fiber optic cables, wires, shielded wires, wireless or other means. The implanted devices 16 and 90 are so constructed as to contain programmable logic

units suitable for analyzing signals from other implanted devices and from sensors 96 and to initiate the adjustment of adjustable parameters of any implanted device in the network. The emitters are so designed as to allow for multiple frequencies and intensities to be emitted at the same time including a carrier and pulsed waves combined. Each of these implanted devices is so constructed as to allow the addition of other implanted or external devices or the removal of said devices from the network of devices without the interruption of other devices in the network. The interconnection of these devices may be made by conventional means. See, e.g., United States patent 5,454,837. The entire disclosure of this United States patent is hereby incorporated by reference into this specification.

In the embodiment depicted in Figure 8, bodily fluid is withdrawn from body 10 via line 104, treated with energy in device 100, and returned to the body via line 102. In this embodiment, a portion of the bodily fluid may be segregated in device 100 and treated separately from the other bodily fluid. Thus, e.g., the device 100 may comprise a flow cytometer which identifies cancerous cells, segregates them, treats them with high heat and/or radiation, and returns some or all of the cells so treated to the body.

In one preferred embodiment, in any or all of the processes of this invention, the electromagnetic energy is delivered directly into one or more bodily fluids, such as, e.g., the blood, the lymph, the urine, cerebrospinal fluid, endolymph, aqueous humor, etc. Reference may be had, e.g., to Figure 8, in which a bodily fluid is treated in reservoir 100 after being removed from a body 10 and then returned to such body 10.

Figure 9 is a flow diagram of one preferred process. In step 102 of the process, the emitter controller 16 (not shown) checks the blood pressure of the biological organism using, e.g., sensors 46 (see Figure 4). If the blood pressure of the organism is lower than a specified

level, in step 104 the process is aborted. If the blood pressure of the organism is higher than such specified level, then in step 106 the controller (not shown) optionally checks other body parameters (such as, e.g., body temperature, pulse rate, etc.) to determine whether it is safe to apply to specified therapy.

After verifying that the therapy regimen is safe, in step 108, millimeter wave frequency is applied for a specified duration such as, e.g., 15 minutes. Thereafter, the blood pressure of the biological organism is again checked in step 102'. In one aspect of this embodiment, if the blood pressure of the organism is still too high after the initial treatment, additional incremental treatments 110 preferably are continued up to a threshold decision point 112. In the embodiment depicted, additional chemical therapy is administered in step 114, and monitored in step 102''. If this additional drug therapy is not effective, the patient is alerted in step 118.

It will be apparent to those skilled in the art that the preferred process depicted in Figure 9 can have constructive application for a variety of other medical conditions besides the amelioration of high blood pressure. For example, another preferred embodiment is in the regulation of carbohydrate metabolism in the diabetic patient. Here the sensor in step 102 monitors the concentration of glucose in the blood and millimeter or other frequencies are emitted in step 108 to effect a stimulation of glucose absorption in the tissues in the body. Again, if the blood glucose concentration in the organism is still too high after the initial treatment, additional incremental treatments 110 preferably are continued up to a threshold decision point 112. In the embodiment depicted, additional electromagnetic energy is administered in step 108 or additional chemical therapy is administered in step 114, and monitored in step 102". If this additional electromagnetic or drug therapy is not effective, the

patient is alerted in step 118. The entire configuration, or suitable variations of it, constitute what has been termed an "artificial pancreas."

Figure 10A is a graph of a spectrum 200 of one preferred energy pattern delivered from the emitter 16 to a patient 10 at "time zero." In the graph of this Figure 10A, frequency is plotted on the horizontal axis 202, and amplitude is plotted on the vertical axis 204.

Referring to the graph depicted in Figure 10A, it will be seen that the spectrum 200 is comprised of major peaks 206, 207 and 208 and minor peaks 210, 212, and 214. In general, the spectrum of the energy emitted by emitter 16, in this embodiment, will contain at least two major peaks and two minor peaks.

The spectrum 216 depicted in the graph of Figure 10B is illustrative of the pattern emitted by the same emitter 16 at some time, t1, after "time zero." As will be apparent, in this embodiment, the spectrum 216 differs from the spectra 200.

When a drug is administered to patient, its spectrum changes as it is dissolved within the patient's system and/or is metabolized within the patient. As the drug undergoes physical and/or chemical changes, its spectrum changes. In one embodiment of this invention, the energy pattern delivered by the emitter 16 is substantially comparable to the energy pattern delivered by a drug as it undergoes physical and/or chemical changes within the patient's body.

One may, by conventional techniques, measure the spectrum of one or more drugs as they interact with and within a patient's body. Thereafter, one may program this spectrum into an emitter comprised of programmable computer such that the emitter will deliver the same energy pattern to a biological organism as the drug did, over time. Thus, e.g., one may use the emitter 16 and the controller 44, as depicted in Figure 4.

It will be apparent to those skilled in the art that the process just described may not be ideal, as alterations in the structure of drug molecules, and resulting alterations in the emission spectrum of the molecules, may be detrimental to the organism, leading to undesired side effects. Hence in another preferred embodiment the computer is programmed such that the emitter will continue to deliver the same energy pattern to a biological organism as the drug did when the drug was first administered to the patient.

In the embodiment of Figure 4, not only is both an emitter and controller present, but a multiplicity of sensors 46 also are present. Thus, with the apparatus depicted in Figure 4, one may monitor the reaction of a patient's body to the administration of electromagnetic energy from the emitter and/or the administration of one or more drugs.

How the energy pattern of any particular drug, or combinations of drugs, or how combinations of drugs and electromagnetic fields, changes over time may be stored within the controller 44 of Figure 4. The response of the patient's body to various portions of such energy patterns may be determined by the sensors 46 and the controller 44. In many cases, it will be determined that a certain portion of the spectral pattern, and/or its combination with one or more drugs, advantageously affects the patient's body. In other cases, it may be determined that a certain portion of the spectral pattern, and/or its combination with one or more drugs, disadvantageously affects the patient's body. The device of Figure 4 will be capable of determining, at any particular point in time, which portion, if any, of the energy pattern and/or drug should be applied at that point in time. Thereafter, by monitoring the patient's reaction to the administered energy pattern(s) and/or drug(s), the controller 44 can cause the emitter 16 or the implantable drug dispenser 240 connected to the controller 44 to modify the energy pattern(s).

If, for example, a drug is being administered which, at a particular point in time, is producing a disadvantageous energy pattern, the emitter 16 may emit one or more interfering and/or phase shifted and/or phase inverted and/or complementary energy patterns which, after they interact with the energy pattern produced by such drug, or with the response of the receptor molecules the drug is acting upon, produce the desired energy pattern and/or lack thereof.

Figure 11A illustrates a spectrum 220. In the particular embodiment depicted in Figure 11A, and for a particular condition, it might be determined that only major peaks 222, 224, and 226 produce advantageous results but that the minor peaks in the "troughs" of the spectra, regions 228, 230, 232, have deleterious effects. In this case, as is illustrated in Figure 11B, the controller 44 will cause emitter 16 to emit only the major peaks 222, 224, and 226.

Alternatively, it may be determined that one or more of the major peaks is the cause of deleterious effects, in which case these major peaks are removed from the emitted spectrum.

The process of this invention is not limited to the use of only one emitter 16 or only one implantable drug dispenser 240. As will be apparent to those skilled in the art, the use of a multiplicity of emitters 16 allows one to produce a large variety of different waveforms and spectra patterns that can interact with a multiplicity of injected drugs. Figures 12A and 12B illustrate the spectral patterns 300 and 302 which may be produced at one particular point in time by emitters 16 and 64 (see Figure 5).

In one embodiment, there is provided an apparatus for treating a biological organism, comprising an externally worn and removable appliance comprised of means for inducing an electromagnetic and/or vibrational and/or light and/or other energy pattern of a biological process and/or a suitable drug or drugs through the skin of a organism which, preferably, is

living. In this embodiment, the energy pattern corresponds to at least a portion of the electromagnetic pattern, or a modification thereof, of a biological process within the organism.

In many cases, it may be desirable to introduce more than one electromagnetic pattern to the patient. Thus, in one embodiment, depicted in Figures 7 and 12, there is provided a process comprising the steps of determining a first electromagnetic pattern of a biological process within a living organism, determining a second electromagnetic pattern of a biological process within a living organism, introducing said first electromagnetic pattern into said living organism, and introducing said second electromagnetic pattern into said living organism. As will be apparent, more than two such electromagnetic patterns may be administered, and they may be administered in combination with one or more drugs.

In one preferred embodiment, in any or all of the processes of this invention, the electromagnetic energy and/or other energy is delivered directly into cartilage. In another embodiment of the invention, the electromagnetic and/or other energy is delivered directly into bone. In yet another embodiment of the invention, the electromagnetic and/or other energy is delivered directly into brain cells. In yet another embodiment of this invention, the electromagnetic and/or other energy is delivered to fascia and/or cerebrospinal fluid and/or other fluids. In yet another embodiment of this invention, the electromagnetic and/or other energy is delivered to acupuncture and/or other biologically active points within and/or on the body.

In any or all of the aforementioned embodiments, one may substitute for part or all of the electromagnetic energy other energy forms, such as vibratory energy.

After a suitable number of correlations have been made with the devices of this invention, one may deliver one or more energy patterns, and/or drugs, adapted to provide anti-allergy signals, anti-aids recognition signals, signals that reduce the side effects of drugs, signals

that mimic the signals of homeopathic remedies, signals that mimic the patterns of heat drugs (such as beta blockers), nitroglycerine, anti-tumor drugs, antibiotics, antiviral agents, stress reducing agents, pain killers, and the like. As will be apparent, this list is merely illustrative.

In one embodiment, a desired electromagnetic spectrum and/or modulated light or sound (including, e.g., ultraviolet light or ultrasound or infrared radiation, e.g.) is injected directly into a patient's blood stream on demand and/or at regular intervals and/or continuously.

In one embodiment, the spectral pattern which exists when the AIDS virus attaches to a lymphocyte is determined, and a pattern designed to interfere with this first spectral pattern is emitted. Thus, e.g., one may emit coherent photon signals that mediate the behavior of the AIDS virion and its attraction to and identification of and docking on the human lymphocyte. In one aspect of this embodiment, either the virion itself and/or a component of the virion is caused to resonate at its natural coherent resonant frequency. Two key elements of such virion are two surface proteins, glycoprotein GP41 and glycoprotein GP 120; they constitute a dielectric antenna. By the application of suitable electromagnetic energy to such "antenna," the AIDS virion can be affected.

In one embodiment, the emitter 16 is comprised of means for transmitting a desired electromagnetic pattern to a pacemaker. Thus, e.g., one may transmit suitable analog, digital, or scalar versions of such signals to a cardiac assist device. In one aspect of this embodiment, the cardiac assist device is adapted to store the spectrum transmitted to it by the emitter 16 and, when appropriate, to retransmit part or all of such spectrum.

In another embodiment, see Figure 13, an emitter is built into a shunt. Referring to Figure 13, a blood artery or vein is divided into two parts 330, 332 and a filter/separator 334 is inserted between them. Arrows 331, 337, 339, 341 show the direction of fluid flow. The

filter/separator 334 diverts a portion for the plasma into line 336. That portion of the blood fluid which is not diverted to 336 is returned to the artery or vein 332. The divert plasma enters an emitter chamber 338 where the energy pattern is applied to the plasma. Said energy pattern may be millimeter wave, acoustic energy, light, etc. as describe throughout this disclosure. The treated plasma returns to the artery or vain through line 340. By way of illustration, but not limitation, 334, 336, 338 may be components of an artificial heart implant into the body.

In another embodiment, fluid is treated externally and independent of a body as it flows through tubing. In Figure 14, tubing 350 carrying a fluid 353 flowing in the direction 354 has an emitter 358 implanted through the tubing wall so that the emitter tip 356 is in contact with the fluid 352. By way of illustration, but not limitation, said tubing 350 may be the fuel line of a vehicle, the water supply line to a faucet, the outlet of a water dispenser, an intravenous (IV) line, an implanted stint, etc. The emitter 358 is connected to a controller 362 by communications means 360 which may be, e.g., a wire, fiber optics cable, RF or other means. The controller 362 controls the type of energy, pattern of energy, application timing, duration, magnitude and/or other adjustable parameters. Additionally, a optional sensor 364 may be inserted into the tubing. Said sensor 364 may measure, e.g., the flow rate of the fluid 352 and/or the temperature of the fluid 352, the pH level of the fluid 352 and/or other measurable properties. Said sensor is connected to controller 362 by communication means 366 which may be, e.g. a wire, fiber optic cable, RF or other means.

In another embodiment (not shown), the emitter tip 356 of Figure 14 is attached externally to the tubing wall 350. In this embodiment, the emitter tip 356 does not come into direct contact with the fluid 352.

In another embodiment, see Figure 14, the fluid 372 to receive the energy pattern treatment is preferably contained in a vessel 370 which has means 371 for removing and/or replenishing said fluid 372. By way of illustration and not limitation, said vessel 370 may be e.g., a hot water heater, a thermos or canteen, a coffee maker, an IV bag, a gasoline tank, etc. In one embodiment, emitter 374 has its emitting tip 376 in contact with fluid 372. In another embodiment (not shown) the emitter tip 376 is external to the vessel 370. In Figure 14, the emitter 374 is connected to controller 380 via communication means 378 which may be, e.g., a wire, fiber optics cable, RF or other means. The controller 380 controls the type of energy, pattern of energy, application timing, duration, magnitude and/or other adjustable parameters. Additionally, an optional sensor 382 may be inserted into the vessel 370. Said sensor 382 may measure, e.g., the temperature of the fluid 372, the pH level of the fluid 372 and/or other measurable properties. Said sensor 382 is connected to controller 380 by communication means 384 which may be, e.g. a wire, fiber optic cable, RF or other means.

It is to be understood that the aforementioned description is illustrative only and that changes can be made in the apparatus, in the ingredients and their proportions, and in the sequence of combinations and process steps, as well as in other aspects of the invention discussed herein, without departing from the scope of the invention as defined in the following claims. Moreover, it is to be understood that maintaining the proper physiology of the heart and liver and carbohydrate metabolism and other organs and tissues have been used as examples of the application of the invention, and that many other diseases and disorders can be approached with this invention without departing from the scope of the invention as defined in the following claims.